NEW ITEMS IN THE NBMA RESOURCE LIBRARY

Science vs. Reality October 2016

TITLE: Carbamazepine in biosolids amended soils- Environmental implications

Author: Sally Brown and Andrew Carpenter
Source: NW Biosolids Biofest Sept 11-13, 2016
Abstract: Andrew and I did a presentation where we used carbamazepine, the anti seizure medication and its' presence in biosolids to showcase how science is often presented to emphasize a point that may or may not have any bearing in the real world. In the first part of the presentation data on carbamazepine is shown in a purely scientific context, with quotes and information from articles that have appeared in this library (See November 2015 and June 2013). In the second part of the presentation, each of these data points is put into the real world context of what biosolids application is like, with associated findings that show minimal to no risk associated with this compound.
Document#: BIN.OR.CBZ.5.11

TITLE: Transfer of wastewater associated pharmaceuticals and personal care products to crop plants from biosolids treated soil

Author: Wu, C., A.L. Spongberg, J.D. Witter, and B.B. Maruthi Sridhar
Source: Ecotoxicology and Environ. Safety 2012 85:104-109
Abstract: The plant uptake of emerging organic contaminants such as pharmaceuticals and personal care products (PPCPs) is receiving increased attention. Biosolids from municipal wastewater treatment have been previously identified as a major source for PPCPs. Thus, plant uptake of PPCPs from biosolids applied soils needs to be understood. In the present study, the uptake of carbamazepine, diphenhydramine, and triclocarban by five vegetable crop plants was examined in a field experiment. At the time of harvest, three compounds were detected in all plants grown in biosolids-treated soils. Calculated root concentration factor (RCF) and shoot concentration factor (SCF) are the highest for carbamazepine followed by triclocarban and diphenhydramine. Positive correlation between RCF and root lipid content was observed for carbamazepine but not for diphenhydramine and triclocarban. The results demon- strate the ability of crop plants to accumulate PPCPs from contaminated soils. The plant uptake processes of PPCPs are likely affected by their physico-chemical properties, and their interaction with soil. The difference uptake behavior between plant species could not solely be attributed to the root lipid content.
Document#: BIN.OR.CBZ.5.12

TITLE: Human exposure to wastewater-derived pharmaceuticals in fresh produce: A randomized controlled trial focusing on Carbamazepine

Author: Paltiel, O., G. Fedorova, G. Tadmor, G. Kleinstern, Y. Maor, and B. Chefetz
Source: Environ. Sci. Tech 2016 DOI: 10.1021/acs.est.5b06256
Abstract Fresh water scarcity has led to increased use of reclaimed wastewater as an alternative and reliable source for crop irrigation. Beyond microbiological safety, concerns have been raised regarding contamination of reclaimed wastewater by xenobiotics including pharmaceuticals. This study focuses on carbamazepine, an anticonvulsant drug which is ubiquitously detected in reclaimed wastewater, highly persistent in soil, and taken up by crops. In a randomized controlled trial we demonstrate that healthy individuals consuming reclaimed wastewater-irrigated produce excreted carbamazepine and its metabolites in their urine, while subjects consuming fresh water-irrigated produce excreted undetectable or significantly lower levels of carbamazepine. We also report that the carbamazepine metabolite pattern at this low exposure level differed from that observed at therapeutic doses. This "proof of concept" study demonstrates that human exposure to xenobiotics occurs through ingestion of reclaimed wastewater-irrigated produce, providing real world data which could guide risk assessments and policy designed to ensure the safe use of wastewater for crop irrigation.
Document#: BIN.OR.CBZ.5.13

TITLE: Modeling uptake of selected pharmaceuticals and personal care products into food crops from biosolids-amended soil

Author: Prosser, R.S., S. Trapp, and P.K. Sibley
Source: Environ. Sci. Tech. 2014 48:11397-11404
Abstract: Biosolids contain a variety of pharmaceuticals and personal care products (PPCPs). Studies have observed the uptake of PPCPs into plants grown in biosolids-amended soils. This study examined the ability of Dynamic Plant Uptake (DPU) model and Biosolids-amended Soil Level IV (BASL4) model to predict the concentration of eight PPCPs in the tissue of plants grown in biosolids-amended soil under a number of exposure scenarios. Concentrations in edible tissue predicted by the models were compared to

concentrations reported in the literature by calculating estimated human daily intake values for both sets of data and comparing them to an acceptable daily intake value. The equilibrium partitioning (EqP) portion of BASL4 overpredicted the concentrations of triclosan, triclocarban, and miconazole in root and shoot tissue by two to three orders of magnitude, while the dynamic carrot root (DCR) portion overpredicted by a single order of magnitude. DPU predicted concentrations of triclosan, triclocarban, miconazole, carbamazepine, and diphenhydramine in plant tissues that were within an order of magnitude of concentrations reported in the literature. The study also found that more empirical data are needed on the uptake of cimetidine, fluoxetine, and gemfibrozil, and other ionizable PPCPs, to confirm the utility of both models. All hazard quotient values calculated from literature data were below 1, with 95.7% of hazard quotient values being below 0.1, indicating that consumption of the chosen PPCPs in plant tissue poses de minimus risk to human health

Document#: BIN.OR.CBZ.5.14

TITLE: Plant uptake of pharmaceutical and personal care products from recycled water and biosolids: a review

Author: Wu, X, L.K. Dodgen, J.L. Conkle, and J. Gan

Source: Sci. Total Environ. 2015 536:665-666

Abstract: Reuse of treated wastewater for agricultural irrigation is growing in arid and semi-arid regions, while increasing amounts of biosolids are being applied to fields to improve agricultural outputs. These historically under-utilized resources contain “emerging contaminants”, such as pharmaceutical and personal care products (PPCPs), which may enter agricultural soils and potentially contaminate food crops. In this review, we summarize recent research and provide a detailed overview of PPCPs in the soil–plant systems, including analytical methods for determination of PPCPs in plant tissues, fate of PPCPs in agricultural soils receiving treated wastewater irrigation or biosolids amendment, and plant uptake of PPCPs under laboratory and field conditions. Mechanisms of uptake and translocation of PPCPs and their metabolisms in plants are also reviewed. Field studies showed that the concentration levels of PPCPs in crops that were irrigated with treated wastewater or applied with biosolids were very low. Potential human exposure to PPCPs through dietary intake was discussed. Information gaps and questions for future research have been identified in this review.

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